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The prior art in figures 1-3b and paragraph 3,4 of page 1 of instant application

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(54) **Calendering method and apparatus**

(57) A calendering method and an apparatus for use in such a method are described in which a paper web 1' is guided for calendering into at least one nip formed between a soft roll (2) and a heated hard roll (3). The width of the web 1' guided into the calender has a minimum width equal to that of the longest soft calender roll (2), thus preventing the burning of an edge section (4) of the soft rolls as the edge section is shielded from the heated roll 3 by the web 1'. A noncalendered edge strip (8) is cut by a cutter 9 and removed prior to the calendered web (1') being further guided to a winder (10).

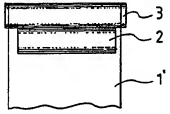

Fig.4

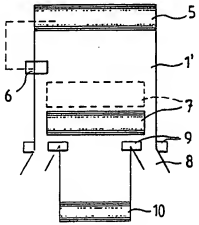

Fig.5

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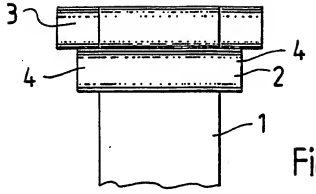
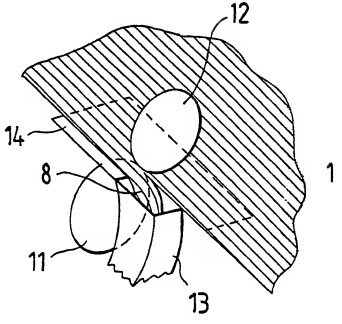


Fig.1

Fig. 2



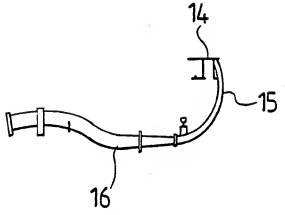


Fig. 3a

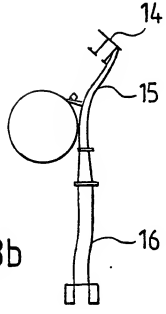


Fig. 3b

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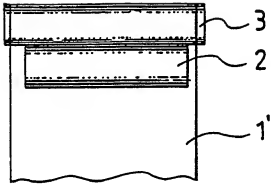

Fig.4

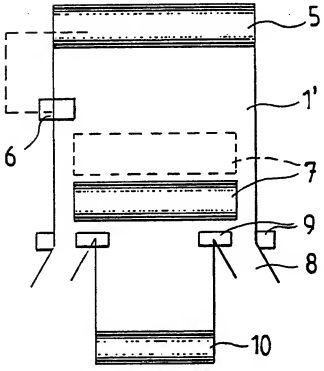

Fig.5

CALENDERING METHOD AND APPARATUS

The present invention relates to a calendering method in which a paper web is guided for calendering into at least one nip formed between a soft roll and a heated hard roll, the calendered web being further guided to a winder.

The invention also concerns a calendering apparatus for the implementation of the above method.

It is known in the art that a high calendering temperature results in a high-quality finish. The use of soft calender rolls, however, gives rise to problems associated with the burning of the ends of the soft rolls, and results in a deteriorated calendering finish at the edges of the web. The burning of roll ends has in the past been prevented by cooling methods using air jets, but these methods are ineffective at elevated temperatures.

As a result the edges of the web being processed will generally be damaged in the process, and any edges which are not acceptable in the processed product are trimmed away in several production stages, e.g., after coating and at the slitter. The plant area is especially limited at the slitter.

The aim of the present invention is to overcome the disadvantages associated with the prior art technology described above and to achieve a totally new kind of a calendering method.

According to the invention there is provided a calendering method in which a paper web is guided for calendering into at least one nip formed between a soft roll and a heated hard roll, the calendered web being further guided to a winder, characterized in that the paper web is at least as wide as any of the soft rolls and in that a noncalendered edge strip is cut away and removed prior to the winder.

Further according to the invention there is provided a calender unit comprising a calender stack which comprises at least one soft roll and a heatable hard roll forming at least one nip into which the paper web to be calendered can be guided, and a winder into which the calendered paper web can be guided for winding, characterized in that the width of the or each soft calender roll is not greater than that of the web to be calendered, and in that there is arranged in the path of the web, between the calender stack and the winder, a cutter with which a noncalendered edge strip can be trimmed away.

The implementation of the present invention avoids burning of coat layers of the expensive soft calender rolls, making the entire surface areas of the rolls available. Further, the awkward trimming operation of the web edge can be omitted at the slitter, with the further advantage of also avoiding edge trimming prior to the calender stack, after web coating.

The invention is next examined in greater detail with help of the exemplifying embodiment illustrated in the attached drawings.

Figure 1 shows in a diagrammatic top view a calendering method according to the conventional technology.

Figure 2 shows in a perspective view a web edge trimming apparatus according to the conventional technology.

Figures 3a and 3b show in side views two alternative edge trimming apparatuses according to the conventional technology.

Figure 4 shows in a diagrammatic top view a calendering method according to the invention.

Figure 5 shows in a diagrammatic top view another calendering method according to the invention.

In order to clarify the embodiments, Figures 1, 4, and 5 are shown in an exaggerated scale.

In several paper grades there is an improved calendering result up to a temperature of about 200...250 °C. Therefore, calendering of a web 1 takes place according to Figure 1 in

a conventional manner in a nip formed between a soft roll 2 and a metallic cast iron roll 3, so that the metallic roll 3 is heated by means of, e.g., circulating hot oil or by induction heating. A typical operating temperature of the cast iron roll 3 is about 150 °C, while the corresponding temperature of the web 1 is about 50 °C after the nip. Especially when running thin webs, the end 4 surfaces of the soft roll 2 are heated approximately up to the temperature of the metallic roll 3, because the rolls are running in a close proximity almost contacting each other. In this condition the surface material of the roll 2 is easily damaged. This is because the maximum operating temperature of elastomers conventionally used for coating the soft roll 2 is only about 80...90 °C. Hardness of the soft rolls 2 in soft calenders typically varies from 20 P&J units up to 93 Shore D units, while the Young's modulus of rolls is from 500 MPa to 4000 MPa. Softer coatings are used in processes which can do with a light calendering, together with the aim of providing maximum preserving protection to the bulk of the web (e.g., when producing folding cardboard). When using hard coatings, calendering with a heavy compression of the web is possible, whereby also the smoothness and gloss of paper improves. Furthermore, hard coatings present a higher web speed and linear pressure tolerance than soft coatings.

Deteriorated coat material of a soft roll can also cause damage to the edge of the web 1. Correspondingly, the web edge is subjected to mechanical stresses in web handling and coating; therefore, a damaged web edge 8 is removed according to Fig. 2 at the slitter by trimming the damaged web edge 8 from the web 1, which supported by a cutting table 14, with the help of a rotating pair of blades consisting of a lower blade 11 and an upper blade 12. The separated web edge 8 is either removed by suction via a suction chute 13 of the trimmed web edge into a pulper (not shown) or, alternatively, the apparatus can be configured

such as to guide the trimmed edge 8 under gravity away from the process. The typical width of the trimmed web edge 8 is about 10...150 mm.

Figures 3a and 3b illustrate the construction of the suction chute channel 13 of the trimmed web edge in detail. The suction chute channel 13 starts as a suction hose 15 at the cutting table 14 and widens into a flexible metal hose 16 when approaching the pulper.

According to Fig. 4, the burning of surfaces at the edge 4 of the soft roll 2 can be avoided by guiding the paper web 1' at an overwidth through the nip, which means that the web 1' extends over the entire width of the soft roll 2, or even slightly overlaps the width. This avoids the burning of the ends 4 of the soft roll 2, because the web 1' acts as an insulator over the entire surface of the soft roll 2. The coat surface temperature of the soft roll 2 is balanced equal with the temperature of the paper web 1'. When the cast iron roll 3 has a temperature of 150 °C, the web temperature typically is 50 °C. During web breaks the nip of the rolls is automatically driven open under the control of the web break signal. This signal can be obtained from, e.g., the web tension measurement, photocells, or the hole/streak detector.

According to Fig. 5 the web 1' is guided from an unwinder 5 past an edge detector 6 into nips formed between the calender rolls 7, where the number of nips can be configured as desired, typically from 2 to 4. The surface temperatures of the heated rolls may vary from 100 °C to 200 °C. The noncalendered edge strips 8 are cut away at a cutter 9 after the last nip and prior to a winder 10. The trimming cutter 9 can be configured in the same manner as the cutter illustrated in conjunction with the slitter shown in Figs. 2, 3a and 3b, where the edge strip 8 is cut with the help of

a pair of blades 11 and 12 and suctioned away back to the pulper via a chute 13.

CLAIMS

1. A calendering method in which a paper web is guided for calendering into at least one nip formed between a soft roll and a heated hard roll, the calendered web being further guided to a winder, characterized in that the paper web is at least as wide as any of the soft rolls and in that a noncalendered edge strip is cut away and removed prior to the winder.

2. A calendering method according to claim 1, in which the edge strip is cut by means of a pair of blades which are arranged on opposite sides of the web.

3. A calender unit comprising a calender stack which comprises at least one soft roll and a heatable hard roll forming at least one nip into which the paper web to be calendered can be guided, and a winder into which the calendered paper web can be guided for winding, characterized in that the width of the or each soft calender roll is not greater than that of the web to be calendered, and in that there is arranged in the path of the web, between the calender stack and the winder, a cutter with which a noncalendered edge strip can be trimmed away.

4. A calendering method according to claim 1, substantially as described with reference to Figure 4 or Figure 5 of the accompanying drawings.

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